

University of Bahrain
College of Information Technology
Computer Engineering Department
Semester 2, 2014/2015
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ITCE 314-Section 1
Name:
ID:
23 March 2015
Duration: 1 Hour

Exam # 1

SOLUTION

Question number	Max. Marks	Marks obtained
Q1	10	
Q2	6	
Q3(A)	5	
Q3(B)	5	
Q4	10	
Q5	5	
Q6(A)	3	
Q6(B)	6	
Total	50	

Instructions:

- Solve all questions
- For question Q1, **circle** the correct answer. Any other type of marking to indicate the answer will be considered **invalid**.
- For Q6(B), answer any three questions. If you answer more than three, then only the first three answers written will be considered for grading.
- Show all your work to claim full credit.

Q1: Circle the most appropriate answer for each of the following:

(10 × 1 marks)

- i) One reason for packet queuing in router's buffer is that ____
- a. the link at which packets arrive to a router has less capacity than the output link capacity
 - b. the link at which packets arrive to a router has capacity equal to that of output link
 - c. the link at which packets arrive to a router has more capacity than the output link capacity
 - d. all of the above
- ii) Application programs run at ____
- a. network edge and network core
 - b. network edge only
 - c. network core only
 - d. network edge, network core, and physical media
- iii) End system are connected to edge routers through ____
- a. residential access nets and mobile access networks only
 - b. mobile access networks and residential access networks only
 - c. institutional networks and mobile access networks only
 - d. residential access nets, institutional networks, and mobile access networks only
- iv) Which of the following is not typically associated with WiMax?
- a. Long distance
 - b. Baseband access
 - c. Wireless WAN
 - d. 3.5G and 4G
- v) Passive and Active optical network technologies are used with?
- a. Fiber-to-home
 - b. Hybrid fiber coax
 - c. WiFi
 - d. WiMax
- vi) Which of the following is NOT true about HFC
- a. uses special cable modem
 - b. generally provides symmetric communication
 - c. high data rate than DSL
 - d. shared broadband medium
- vii) Statistical multiplexing is used with ____
- a. client/server communication model only
 - b. peer-peer communication model only
 - c. packet-switched communication
 - d. circuit-switched communication

viii) Which of the following concepts is NOT associated with circuit switching?

- a. shared resources
- b. reservation of link bandwidth
- c. call setup requirement
- d. time division multiplexing

ix) Which one of the following will generally have the lowest error rate?

- a. Twisted pair
- b. Fiber optic
- c. Baseband coaxial
- d. Broadband coaxial

x) Which of the following is NOT true about Coaxial cable?

- a. uses three concentric copper cables
- b. bidirectional
- c. comes as baseband and broadband
- d. used in HFC

Q2: The following table provides some terms and descriptions. Relate the term with its corresponding correct description by providing the correct alphabet in the third column.

Term	Description	Correct Answer
A. Hybrid-fiber Coax	Minimal (or no use) of dedicated servers	E
B. Coax cable	Best effort	I
C. Radio link	Good for home networks due to less wiring and more mobility	F
D. Circuit switching	Passive and active optical networks	H
E. Peer-peer model	Store-and-forward	G
F. WiFi	Baseband and broadband	B
G. Packet switching	Shared broadband medium	A
H. Fiber to Home	End-to-end resource reservation	D
I. Unreliable service	Terrestrial microwave	C
J. Reliable service	No data loss or data error	J
K. Network core	Interconnected routers	K
L. Network edge	Applications and hosts	L

Q3(a): Imagine the length of a cable is 2500 meters. If the speed of propagation in a twisted pair cable is 60% of the speed of light, how long does it take for a bit to travel from the beginning to the end of the cable? Ignore any other delays. (Speed of light = 3×10^8 meters /sec)

Solution:

Speed of propagation = 60% x c

$$= 60 \times 3 \times 10^8 / 100$$

$$= 18 \times 10^7 \text{ meters / sec.}$$

So it would take a bit $2500 / 18 \times 10^7 = 1.38 \times 10^{-5}$ secs.

Q3(b): Suppose you would like to urgently deliver 30 Terabytes of data from Dammam to Jeddah. You have a 500 Mbps dedicated link for data transfer available. Would you prefer to transmit the data via this link or instead use a courier service that does delivery within 24 hours? Explain all pros and cons.
(1 Terrabyte = 8×10^{12} bits)

Solution:

30 terabytes = $30 \times 10^{12} \times 8$ bits. So, if using the dedicated link, it will take $(30 \times 10^{12} \times 8) / (500 \times 10^6) = 480000$ seconds = 8000 minutes \approx 5.6 days. With courier service, you can guarantee the data arrives within one day. but it will cost you some money. However, if you transmit the data over link, it will not only take longer time, but may also result in errors and data loss, which will not be the case with courier (unless the whole package is lost which is unlikely !)

Q4: Consider two hosts, A and B, connected by a single link of rate R bps. Suppose that the two hosts are separated by m meters, and suppose the propagation speed along the link is s meters/sec. Host A is to send a packet of size L bits to host B.

- (a) Express the propagation delay (d_{prop}) in terms of m and s .
- (b) What will be the transmission time of the packet (d_{trans}) in terms of L and R ?
- (c) Ignoring processing and queuing delays, obtain an expression for the end-to-end delay
- (d) Suppose $s = 2.5 \times 10^8$, $L = 200$ bits, and $R = 56$ kbps. Find the distance m so that d_{prop} equals d_{trans}

Answers:

- (a) m/s seconds
- (b) L/R seconds
- (c) $(m/s) + (L/R)$ seconds
- (d) $L/R = m/s$

$$m \approx 892.8 \text{ Km}$$

Q5: Suppose users share a 10 Mbps link. Also suppose each user transmits continuously at 2 Mbps when they are transmitting, but each user transmits only 20% of the time. If circuit switching is used, what is the maximum # of users that can be supported on the link? Why?

Ans: 5 users (10 Mbps/ 2 Mbps), because in circuit switching every user must have their allocated time available for their use at all times, even if they are often idle or partially using it.

Q6(A) Compare Circuit-switching and Packet switching (answer as “yes” or “no”)

	Circuit Switching	Packet Switching
Link bandwidth reservation	Yes	No
Network Resource sharing	No	Yes
Call setup requirement	Yes	No

Q6(B): Write short answers to any 3 questions. All questions carry equal marks (2 points each)

(a) What are the four causes of packet delay?

Ans: nodal processing delay, queuing delay, transmission delay, propagation delay

(b) List four “distributed” applications

Ans: Web, VoIP, email, games, e-commerce, file sharing

(c) What does “asymmetric communication” mean?

Ans: The upstream and downstream data rate are different.

(d) What are the four radio link types?

Ans: Terrestrial microwave, LAN (e.g., Wifi), wide-area (e.g., cellular), satellite

(e) Mention four components associated with typical home networks.

Ans: DSL or cable modem, router/firewall/NAT, Ethernet, wireless access point